THE PREVALENCE OF SLEEP DISORDERS AMONG SUBSTANCE ABUSERS ADMITTED TO DRUG DE-ADDICTION UNIT AT ERADAH AND MENTAL HEALTH COMPLEX, TAIF, SAUDI ARABIA

Javed Ather Siddiqui,[1,4] Ali Mahmoud Eldous,[2,4] Shazia Farheen Qureshi,[3] Hani Matrok Alotaibi,[4,5] Sameh Hamdan,[4,6] Ali Ahmed Almahruqi,[4,7]

Correspondence: javedsiddiqui2000@gmail.com

[1] Department of Psychiatry, Seth Gordhandas Sunderdas Medical College and the King Edward Memorial Hospital, Mumbai 400012, India.

[2] Benha University, Benha 13518, Egypt.

[3] Department of Psychiatry, JIIU's Indian Institute of Medical Sciences Research, Jalna 431202, India.

[4] Department of Psychiatry, Eradah & Mental Health Complex – Taif 21944, Saudi Arabia.

[5] Saudi Board of Psychiatry, Saudi Arabia.

[6] Assiut University, Assiut 71515, Egypt.

[7] Zagazig University, Alsharqia 44519, Egypt.

ORIGINAL ARTICLE   **OPEN ACCESS**

ABSTRACT

Introduction – Public health is affected by substance abuse, which is associated with high mortality and morbidity rates. A person who suffers from substance use disorder is more likely to suffer from insomnia. The health and social well-being of individuals and communities are adversely affected by these substances. Therefore, in recent years, research has become increasingly interested in the connection between substance abuse and sleep. The main objectives of this study are to evaluate the prevalence of sleep disorders; to investigate any relationship between sleep disorder and impact of sleep on daily functioning; to evaluate the socio-demographic profile; to find out the sleep disturbances caused by specific substances of abuse and to elucidate the relationship of sleep disturbances and substance use.

Methods – Substance abusers with sleep disorders admitted to the hospital who met the inclusion and exclusion criteria were included in this study. The data was collected using sociodemographic information and a sleep 50 scale to interview subjects who are active substance abusers. The data was analyzed using SPSS software.

Results – A high prevalence of sleep disorder was found in male group of patients. Among the 653 substance users, 643 (98.47%) were male and 10 (1.53%) were female. According to the survey, 284 (43.50%) of the participants reported abusing substances during their 25 to 30 years of age, following by 215 (32.92%) during their 18 to 24 years of age. In this study, various sleep disorders among drug addicts were systematically evaluated.

Discuss – The prevalence of various sleep disorders in this population along with the prevalence in general population in parenthesis. These are as follows, sleep disorder was noted in 475 (72.74%) of the subjects, and 178 (27.26%) had without sleep disorder in Substance Abusers. Insomnia symptoms were highly prevalent 351(73.89%), followed by restless leg were reported in 157 (33.05%) of the subjects and lowest in circadian rhythm disorder 8 (1.68%).

Conclusion – The incidence of substance abuse has grown dramatically over the last few decades and is affecting every aspect of society. Due to their wide availability, amphetamine and cannabis abusers were the most prevalent in our study, and sleep disorders, including insomnia, were the most prevalent.

Keywords: sleep disorders, substance use, insomnia.

INTRODUCTION

People with substance use disorders often complain of sleep problems. The symptoms can come and go during withdrawal, or they can last for months or years after recovery begins.[1] An individual with substance use disorder is more likely to experience sleep disturbances. The relationship between sleep disturbances and substance use is bidirectional.[2] Sleep disruptions are primarily caused by drugs of abuse, affecting the ability to fall asleep, making it harder to stay asleep, and altering the cycle of sleep stages from non-rapid eye movement (NREM) sleep to rapid eye movement (REM). It is common for people who use drugs and alcohol to experience sleep problems. It is estimated that 70 percent of patients being admitted for detoxification report sleeping problems prior to admission, and 80 percent of those who report sleep problems attribute them to their substance abuse.[3] Patients with addictive disorders are more likely to experience sleep disorders.[4]

There are a number of sleeping disorders associated with the abuse of various substances, including insomnia, daytime sleepiness, parasomnia, and sleep apnea.[5] Sleep disorders such as insomnia, sleep apnea, and restless leg syndrome are the most common.[4] There are also other substances of abuse that can disrupt sleep, such as marijuana, nicotine, caffeine, and cocaine. There are complex mechanisms involved in establishing and maintaining healthy sleep that are disrupted by these substances. There are a number of neurotransmitter systems affected by them, including acetylcholine, dopamine, gamma-aminobutyric acid (GABA), glutamate, norepinephrine, and orexin.[6]

It is estimated that 33 percent of the general population experience insomnia symptoms such as the inability to get to sleep or maintain sleep.[7] There is a high rate of insomnia among alcohol-dependent patients, and the rates vary from 36 to 91 percent.[8] It is also possible that alcohol causes increased upper airway resistance and snoring even in people without any previous history of obstructive sleep apnea (OSA).[9] Several subjective studies have shown marijuana improve sleep onset, but no polysomnographic studies have proven it.[10, 11] When marijuana is used acutely, stage N3 sleep may increase slightly, but when it is used chronically and in withdrawn form, stage N3 sleep may decrease a little[12] If heavy marijuana use is abruptly discontinued, sleep quality can be affected, and relapses can occur much earlier. Intoxication and withdrawal from opiates may also lead to changes in sleep architecture. There are sleep problems associated with opiates when used in induction, maintenance, or abstinence phases.[13] The use of chronic opioids can cause central sleep apnea, which is observed in 30 percent of patients on methadone maintenance therapy.[14] A number of sleep disturbances occur during cocaine intoxication and withdrawal, such as insomnia and hypersomnia, which affect the sleep cycle. It generally takes about 1 week for sleep disturbances to subside.[15] The effects of cocaine abstinence may result in persistent and progressive sleep disturbances.[16, 17] The withdrawal phase results in a decrease in sleep latency, an increase in sleep efficiency, and an increase in total sleep time.[18]

It has been reported that caffeine administration close to bedtime can result in an increased sleep latency, a decrease in total sleep time, and a decrease in sleep stage N3.[19]. In general, caffeine takes about 6 hours for our bodies to respond. Additionally, caffeine withdrawal may increase sleep latency. There are several mechanisms through which nicotine affects sleep directly and indirectly.[20] It is common for sleep disruptions to be caused by nicotine withdrawal during sleep.[21] Furthermore, smoking can lead to several medical issues, including chronic obstructive pulmonary disease, which can disrupt sleep and alter sleep patterns. As a result, smokers report difficulty initiating and maintaining sleep as well as dissatisfaction with sleep quality.

METHOD

Participants

Study participants included male inpatients unit at the Eradah & Mental Health Complex - Taif, Saudi Arabia, who were in the Drug de-addiction Unit. Patients admitted to the drug de-addiction unit between March 2023 and May 2024 were included in the study.

Inclusion criteria
1. A patient who abuses drugs.
2. Patients who have participated in the study are admitted as indoor (IPD) patients for quitting substances.
3. The participants had been diagnosed with different types of drug abuse over the past year.

Exclusion criteria
1. Patients of geriatric age.
2. Participants are under the age of 18.
3. Injectable route to substance abuse.
4. Cognitively impaired patients.
5. Patients who are uncooperative and unresponsive.

Ethical issues in research
Research work began after the Ethical Committee of the Scientific Research Ethics Committee at King Faisal Medical Complex in Taif, approved it. Approval no- 2024-E-89 (TAIF HEALTH CLUSTER).

Data analysis
There was a cross sectional self-administered questionnaire-based study conducted in the Drug de-addiction Unit at Taif, Eradah and Mental Health Hospital in Saudi Arabia. As part of the study, the researcher explained the study to hospital management and obtained written consent from them. Patient consent was obtained in Arabic, a language they could understand, and they had the option of accepting or rejecting the study. Patients admitted to the drug de-addiction unit between March 2023 and May 2024 were included in the study. Two tools were used to recruit patients who were active drug addicts admitted to a drug addiction ward. Firstly, the sociodemographic information. Secondly, the Sleep-50 questionnaire was administered to identify sleep disorders. Results were analyzed using SPSS software, with categorical variables described using frequencies and proportions. A validation and scoring system for the Sleep-50 questionnaire scale developed by Spoormaker. In this questionnaire, 50 questions (items) were divided into seven sections (subscales), each of which assessed a specific sleep disorder.[22]

RESULT

In this study, participants were studied in an indoor unit (IPD) of the drug de-addiction department. A total of 653 substance abusers were monitored (N=653). Based on the SLEEP-50, out of 653 substance abusers 475 (72.74%) of patients were at risk for a sleep disorder, and 178 (27.26%) were without sleep disorder; these are shown in figure 1. The subjects were admitted because they wanted to stop using illicit drugs.
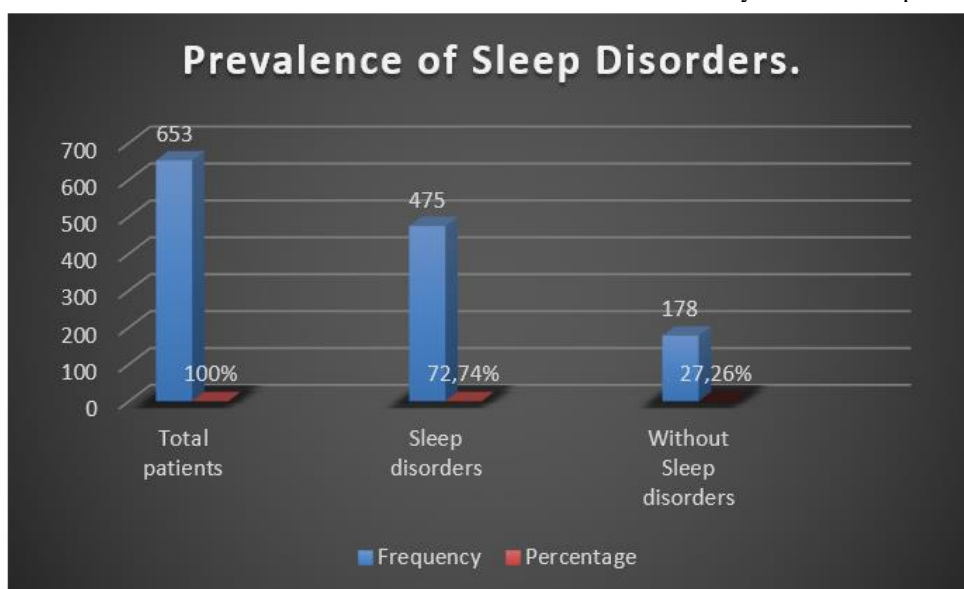

Figure 1. Distribution of sleep disorder

Table 1 shows socio-demographic profiles and other study variables. The study included all age groups except geriatrics. The majority of the respondents who were abusing substances belonged to the age group of 25 to 30 years with 284 (43.50%), followed by 215 (32.92%) in 18 to 24 years, and minimum number of abusers observed in 41 to 50 years with 44 (6.74%). The majority of subjects were male 643 (98.47%), while 10 (1.53%) of the abusers were female. A maximum of 450 abusers were unmarried (68.91%), and 184 were married (28.18%).

Table 1. Distribution of total subjects by socio-demographic characteristics

Age distribution		
Age in Years	Frequency	Percentage
18-24	215	32.92%
25-30	284	43.50%
31-40	110	16.84%
41-50	44	06.74%
>51	0	0
Total	653	100%
Gender		
Male	643	98.47%
Female	10	01.53%
Total	653	100%
Marital Status		
Married	184	28.18%
Unmarried	450	68.91%
Divorced	19	02.91%
Total	653	100%
Midday Nap		
Yes	360	55.14%
No	293	44.86%
Total	653	100%

Table 2 shows further analysis of the study variables with the Sleep-50 questionnaire scale. There was a statistically significant relationship between the Sleep-50 questionnaire scores and gender. It is interesting to note that excessive daytime sleepiness was more common in female participants. There was a significant relationship between gender and sleep disorder, with males more affected at 469 (98.74%) than females at 6 (1.26%) with (p=0.00001). A daily sleeping hour of less than 4 was reported by 50.95% of the participants, followed by 5–6 hours by 49.05%, while small numbers of patients were sleeping more than 10 hours (13.48%). Most of the participants with sleep disorders were in the age group 18-24 years, around 164, or about 34.53% followed 25-30 years age group with 140 (29.47%), and lowest at 41-50 years were 81(17.05%) (p=0.00001). Unmarried substance abuser has more sleep disorder 331(69.69%) than married 134(28.21%) with (p=0.000011). Midday naps were found in substance abusers with sleep disorder participants 296(62.31%) (p=0.000181). A daily sleeping hour of less than 4 was reported by 242(50.95%) of the participants and followed by 5–6 hours by 233(49.05%), while small numbers of patients were sleeping more than 10 hours (13.48%).

Table 2. Relationship between sleep disorders and characteristic by the Slee-50 questionnaire scale

Age distribution				
Age in Years	Sleep disorder Yes (%) N=475	Sleep disorder No (%) N=178	χ2- Value	p- Value
18-24	164(34.53%)	48(26.96%)	45.7142	0.00001
25-30	140(29.47%)	24(13.49%)		
31-40	90(18.95%)	34(19.10%)		
41-50	81(17.05%)	72(40.45%)		
Total	475	178		p < .05.
Gender				
Male	469(98.74%)	155(87%)	41.4674	0.00001
Female	6(1.26%)	23(13%)		
Total	475	178		p < .05
Marital Status				
Married	134(28.21%)	23(12.92%)	22.8741	0.000011
Unmarried	331(69.69%)	143(80.33%)		
Divorced	10(2.10%)	12(6.74%)		
Total	475	178		p < .05.
Sleep Hours				
<4 hrs	242(50.95%)	0		
5 – 6 hrs	233(49.05%)	0		
7 – 10 hrs	0	154(86.52%)		
>10 hrs	0	24(13.48%)		
Midday nap				
Yes	296(62.31%)	82(46.07%)	14.0224	0.000181
No	179(37.69%)	96(53.93%)		
Total	475	178		p < .05.

We interviewed 653 substance abuse patients following a systematic sampling procedure in a peaceful, non-threatening environment. Due to the common use of amphetamine and cannabis in Saudi Arabia, about 227 (34.76%) of respondents considered the combined substances amphetamine and cannabis as their preferred drug, followed by single abusers such as amphetamine 203 (31.08%) orally, and 94 (14.40%) abusing poly-substances. Alcohol abuse is lower in numbers 19 (2.91%) due to prohibition in Islamic countries; these data are shown in Table 3.

Table 3. Patterns of substance abuse

Pattern of substance abuse	Frequency	Percentage(%)
Amphetamine +Cannabis	227	34.76%
Amphetamine	203	31.08%
Cannabis	110	16.85%
Polysubstance abuse	94	14.40%
Alcohol	19	02.91%
Total	653	100%

Table 4 presents the prevalence of specific sleep disorders. The sleep 50 questionnaire was used in diagnosing seven common sleep disorders, 475 (72.74%) of the participants complained of at least one sleep disorder. The most prevalent disorder was insomnia with 351 (73.89%), followed by restless leg 157 (33.05%), obstructive sleep apnea 32 (6.73%), and narcolepsy 30(6.31%). Prevalence rates for sleepwalking, nightmares, and circadian rhythm disorder were low, such as nightmares 23 (4.84%), sleep walking 12 (2.52%), and circadian rhythm disorder 8 (1.68%) is lowest.

Table 4. Prevalence of sleep disorders by the Sleep-50 questionnaire scale

Sleep disorders	Frequency	Percentage
Insomnia (Item 9-16)	351	73.89%
Obstructive sleep apnea (Item 1-8)	32	6.73%
Narcolepsy (Section 17-21)	30	6.31%
Restless leg/ periodic limb movement disorder (Item 22-25)	157	33.05%
Circadian rhythm disorder (Item 26-28)	8	1.68%
Sleepwalking (Item 29-31)	12	2.52%
Nightmares (Item 32-36)	23	4.84%
Total of those having ≥1 sleep disorder	475	72.74%

Table 5 lists frequencies of combined sleep disorder with 196 (30.01%) of participants positive for at least two sleep disorders, 156 (23.88%) has three combined sleep disorders, 98 (15%) has four combined sleep disorders, 85 (13.01%) five combined disorders, 33 (5.05%) six combined sleep disorders and 13 persons with 1.99% has seven combined sleep disorders.

Table 5. Frequencies of combined sleep disorders

Sleep disorders	Frequency	Percentage
Two combined sleep disorders	196	30.01%
Three combined sleep disorders	156	23.88%
Four combined sleep disorders	98	15%
Five combined sleep disorders	85	13.01%
Six combined sleep disorders	33	5.05%
Seven combined sleep disorders	13	1.99%

DISCUSS

In our study, we focused on observational data. Our study examines the socio-demographic profile of substance abuse patients at an Eradah and mental health hospital in Taif, Saudi Arabia, and the impact of various socio-demographic characteristics on substance abuse. According to the Diagnostic and Statistical Manual for Mental Disorders, all participants had at least one substance abuse or dependence problem. About 34.76% considered the combined substances amphetamine and cannabis as their preferred drug, followed by single abusers such as amphetamine 31.08 % orally, and 14.40% abusing poly-substances. Alcohol abuse is lower in numbers 2.91% due to prohibition in Islamic countries. Another study in Saudi Arabia showed similar findings like 124 (34.64%) of respondents considered the combined substances amphetamine and cannabis as their preferred drug, followed by single abusers such as amphetamine 110 (30.73%) orally, and 60 (16.76%) abusing poly-substances. Alcohol abuse is lower in numbers 9 (2.51%) due to prohibition in Islamic countries.[23]

The results showed that unmarried males had a higher prevalence of substance abuse. The most common substance abuse was amphetamine and cannabis combined, followed by amphetamine and poly-substance abuse. However, there was less alcohol abuse in Islamic countries due to religious and legal prohibitions, and other substances contributed to a small proportion of sampled substances. The mean total sleep time in drug abusers was 5.5 hours, which is less than the widely accepted norm of 7 to 8 hours of sleep per night. In our study, the total sleep time of drug abuser patients was 5.6 hours. About three-fourths of patients thought substance abuse affected their sleep, and less than half of the patients felt that they had a sleep problem that required further assessment.

The results from our study show a very high prevalence of sleep disturbances among subjects with substance abuse or dependence, with almost all of the subjects reporting impaired sleep quality. Also, the maximum number of subjects had insomnia. This is much higher than what is found in the general population (17–30%).[24, 25] At least one sleep disorder was found in 46.6% of this study population this is higher to

Abdulghani with 36.6% of students in Riyadh king Saud university and lesser to Umm al Qura study who found 73% students with sleep disorder.

Our study has systematically evaluated various sleep disorders. Diagnosing and treating sleep disorders will have a big impact on inducing remission. In our study, the prevalence of sleep disorders in the patients is 73.89% insomnia was noted followed by restless leg syndrome 33.05%, sleep apnea 6.73%, narcolepsy is with 6.31% of study population, nightmares 4.84%, sleep walk 2.52%, and circadian rhythm 1.68% is the lowest in numbers. Only 27.26 % of the subjects did not have sleep problems so almost all the patients admitted for abusing substances need to promote sleep. In other study seen in umm al Qura study with narcolepsy with 51.6%, insomnia 31.5%, circadian rhythm and restless leg syndrome with 22.4%, 16.4% obstructive sleep apnea.[26] In another study ratio is in contrast with stated 22% insomnia, 17% nightmares, 8% circadian rhythm disorder, 7% had narcolepsy & restless leg syndrome.[27] The finding that 35% of students were at risk for narcolepsy is high.

Females were at greater risk for at least one sleep disorder. Women are more likely to report depression, anxiety, and nightmares, which are associated with stress and psychopathology. At least one sleep disorder was found in 72.74% of this study population. This is higher with 36.6% of students in Riyadh King Saud University[28] and near to the Umm al Qura study, which found 73% of students had sleep disorders. In our study, the participants were asked to rate their sleep from 1 to 10, where 475 members have very bad sleep whereas 178 members have satisfied sleep. A daily sleeping hour of less than 4 was reported by 50.95% of the participants, followed by 5–6 hours by 49.05%, while small numbers of patients were sleeping more than 10 hours (13.48%). Also, in our study, injectable routes of administration of substances are not seen.

The study's limitations are as follows:

- A study will be conducted only on admitted patients who have abused substances in the past one and a half years.
- Small sample size
- Collection of data from self-administered questionnaires
- A lack of objective sleep metrics limits clinicians' ability to use the findings.
- This study was primarily focused on individuals who were seeking treatment.

It is warranted to perform a follow-up study with a larger sample size and objective sleep metrics, such as Actigraphy, Polysomnography, and Multiple Sleep Latency Test (MSLT), to further clarify the findings. However, electrophysiological tests are recommended as a second choice because the diagnosis of insomnia is mainly clinical and is based on the history of the patient. It is important to highlight that there are very few analyses that describe the prevalence of insomnia and that specify the type of sleep disorder. Most of the studies published in the literature only include alcohol-dependent patients.

CONCLUSION

Sleep abnormalities are associated with the acute and chronic use of addictive substances. There is widespread recognition of sleep disorders associated with the use and abstinence of addictive substances. Researchers confirm that patients with substance abuse or dependence experience a high prevalence of sleep disruptions and shed light on the prevalence of different sleep disorders. All types of sleep disorders are significantly associated with benzodiazepine use disorders. It is recommended that substance abusers be routinely checked for sleep problems. There is always the challenge of persistent remission in substance abuse disorders due to frequent relapses. Sleep disorders might be more easily treated if they are diagnosed and treated early. As there is a high number of males involved, there is a need to raise awareness to encourage them to seek treatment. It is necessary to conduct more longitudinal and cross-sectional research on illicit drugs. Researchers should also explore sleep-promoting agents that are low in abuse potential and can target specific aspects of sleep that are affected by substance abuse.

<u>Conflict of interest</u>

The authors declared there was no conflict of interest.

<u>Author contribution</u>

JAS- material preparation, conception and design, or acquisition of data, or analysis and interpretation of data, AME & SFQ- draft of the manuscript was written, drafting or revising it critically for significant intellectual content & Critical review. HMA- editing of the final manuscript. AME-SAH- manuscript review and AAA- data analysis was done.

REFERENCES

1. Teplin D, Raz B, Daiter J, Varenbut M, Tyrrell M. Screening for substance use patterns among patients referred for a variety of sleep complaints. American Journal of Drug and Alcohol Abuse. 2006;32(1):111–120. https://doi.org/10.1080/00952990500328695.
2. Ara A, Jacobs W, Bhat IA, McCall WV. Sleep disturbances and substance use disorders. A Bi-directional relationship. Psychiatric Annals. 2016;46(7):408-412. https://doi.org/10.3928/00485713-20160512-01.
3. Roncero C, Grau-Lopez L, Diaz-Moran S, Miquel L, Martinez-Luna N, Casas M. Evaluation of sleep disorders in drug dependent inpatients. Med Clin (Barc). 2012:138(8);332–335. https://doi.org/10.1016/j.medcli.2011.07.0153.
4. Mahfoud Y, Talih F, Streem D, Budur K. Sleep disorders in substance abusers: how common are they? Psychiatry (Edgmont). 2009;6(9): 38-42. https://pubmed.ncbi.nlm.nih.gov/19855859/
5. Schierenbeck T, Riemann D, Berger M, Hornyak M (2008) Effect of illicit recreational drugs upon sleep: cocaine, ecstasy and marijuana. Sleep Med Rev 2009;12(5): 381-389. https://doi.org/10.1016/j.smrv.2007.12.004.
6. Cohn TJ, Foster JH, Peters TJ. Sequential studies of sleep disturbance and quality of life in abstaining alcoholics. Addict Biol. 2003;8(4):455-62. https://doi.org/10.1080/13556210310001646439.
7. Ohayon M M. Epidemiology of insomnia: What we know and what we still need to learn. Sleep Med Rev. 2002;6(2):97-111. https://doi.org/10.1053/smrv.2002.0186.
8. Ebrahim IO, Shapiro CM, Williams AJ, Fenwick PB. Alcohol and sleep I: effects on normal sleep. Alcohol Clin Exp Res. 2013;37(4):539-49. https://doi.org/10.1111/acer.12006.

9. Brower KJ. Alcohol's effects on sleep in alcoholics. Alcohol Res Health. 2001;25(2):110-125. https://pubmed.ncbi.nlm.nih.gov/11584550/

10. Feinberg I, Jones R, Walker JM, Cavness C, March J (1975) Effects of high dosage delta-9-tetrahydrocannabinol on sleep patterns in man. Clin Pharmacol Ther. 1975;17(4):458-66. https://doi.org/10.1002/cpt1975174458.

11. Barratt ES, Beaver W, White R. The effects of marijuana on human sleep patterns. Biol Psychiatry 1974;8(1): 47-54. https://pubmed.ncbi.nlm.nih.gov/4361028/

12. Bolla KI, Lesage SR, Gamaldo CE, Neubauer DN, Funderburk FR. Sleep disturbance in heavy marijuana users. Sleep. 2008;31(6):901-8. https://doi.org/10.1093/sleep/31.6.901.

13. Wang D, Teichtahl H. Opioids, sleep architecture and sleep-disordered breathing. Sleep Med Rev. 2007;11(1):35-46. https://doi.org/10.1016/j.smrv.2006.03.006.

14. Sharkey KM, Kurth ME, Anderson BJ, Corso RP, Millman RP. Assessing sleep in opioid dependence: a comparison of subjective ratings, sleep diaries, and home polysomnography in methadone maintenance patients. Drug Alcohol Depend. 2011 Jan 15; 113(2-3): 245–248. https://doi.org/10.1016/j.drugalcdep.2010.08.007

15. Johanson CE, Roehrs T, Schuh K, Warbasse L. The effects of cocaine on mood and sleep in cocaine-dependent males. Exp Clin Psychopharmacol. 1999;7(4):338-46. https://doi.org/10.1037//1064-1297.7.4.338.

16. Watson R, Bakos L, Compton P, Gawin F. Cocaine use and withdrawal: the effect on sleep and mood. Am J Drug Alcohol Abuse. 1992;18(1):21-8. https://doi.org/10.3109/00952999209001608.

17. Trksak GH, Bracken BK, Jensen JE, Plante DT, Penetar DM. Effects of sleep deprivation on brain bioenergetics, sleep, and cognitive performance in cocainedependent individuals. ScientificWorldJournal. 2013: 947879. https://doi.org/10.1155/2013/947879

18. Ogeil RP, Phillips JG. Commonly used stimulants: sleep problems, dependence and psychological distress. Drug Alcohol Depend. 2015;1:153:145-51. https://doi.org/10.1016/j.drugalcdep.2015.05.036.

19. Landolt HP, Werth E, Borbély AA, Dijk DJ. Caffeine intake (200 mg) in the morning affects human sleep and EEG power spectra at night. Brain Res. 1995;27:675(1-2):67-74. https://doi.org/10.1016/0006-8993(95)00040-w.

20. Zhang L, Samet J, Caffo B, Punjabi NM. Cigarette smoking and nocturnal sleep architecture. Am J Epidemiol. 2006;164(6):529-37. https://doi.org/10.1093/aje/kwj231.

21. Wetter DW, Fiore MC, Baker TB, Young TB. Tobacco withdrawal and nicotine replacement influence objective measures of sleep. J Consult Clin Psychol. 1995;63(4):658-67. https://doi.org/10.1037//0022-006x.63.4.658.

22. Spoormaker VI, Verbeek I, van den Bout J, Klip EC. Initial validation of the SLEEP-50 questionnaire. Behav Sleep Med. 2005;3(4):227-46. https://doi.org/10.1207/s15402010bsm0304_4.

23. Siddiqui JA, Qureshi SF, Eldaous AM, Shawosh YBA. The phenomenology, socio-demographic, and clinical profile of substance abusers admitted to drug de-addiction unit at eradah and mental health hospital, taif, Saudi Arabia. Psychosom Med Res. 2023;5(2):9. https://doi.org/10.53388/PSMR2023009

24. Mellinger GD, Balter MB, Uhlenhuth EH. Insomnia and its treatment: prevalence and correlates. Arch Gen Psychiatry. 1985;42(3):225-32. https://doi.org/10.1001/archpsyc.1985.01790260019002.

25. Katz D, McHorney CA. Clinical correlates of sleep disturbances in patients with chronic illness. Arch Intern Med. 1998 May 25;158(10):1099-107. https://doi.org/10.1001/archinte.158.10.1099.

26. Goweda RA, Hassan-Hussein A, Ali, Alqahtani M, Janaini MM, Alzahrani AH, Sindy BM. Prevalence of sleep disorders among medical students of Umm Al-Qura University, Makkah, Kingdom of Saudi Arabia. J Public Health Res. 2020; 9(Suppl 1): 2020. https://doi.org/10.4081/jphr.2020.1921.

27. Thomas S. A survey of Sleep disorders in college student: A study of Prevalence and Outcomes. Ph.D. dissertation. Tuscaloosa (AL): University of Alabama; c2014. https://ir.ua.edu/items/b7fc1b4e-9214-41a5-8629-eb3e872ce115

28. Abdulghani HM, Alrowais NA, Bin-Saad NS. Sleep disorder among medical students: Relationship to their academic performance. Med Teach. 2012:34 Suppl 1:S37-41. https://doi.org/10.3109/0142159X.2012.656749.